National Weather Service, Jacksonville

The Sea Breeze

It brings relief from summer's oppressive heat and is the most common trigger of Florida's warm season convection.

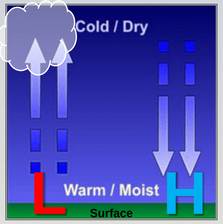
Sea Breeze Formation

- A thermally driven circulation most common along coast lines
- Occurs when land becomes warmer than the water; spring – autumn.
- The greater the land/sea temperature difference, the greater the chance for a sea breeze to form.

Thermal Circulation and Convection

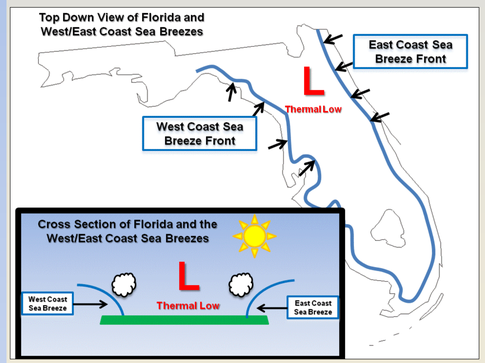
If the warm air has moisture in it, as it rises, it cools, condenses and forms clouds; a visible sign of convection!

Air near the earth's surface is warm compared to air aloft (the earth's atmosphere is warmed by outgoing radiation, or heat, from the earth itself).

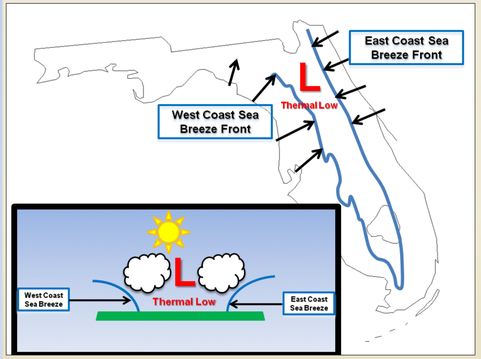


Since cold air is more dense (heavier) than the warm air, it sinks toward the ground. This forces the warm air upward. This process is called convection.

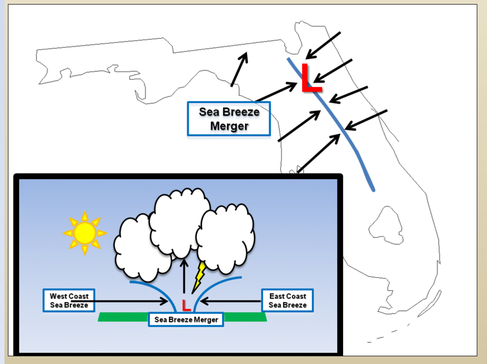
LOW pressure forms under rising air. **HIGH** pressure forms under sinking air.



Air over land heats more rapidly than air over the ocean. Typically by late morning, as air rises over land, an area of low pressure forms near the surface. More air is drawn into the low from the west and east (Gulf of Mexico and Atlantic Ocean).



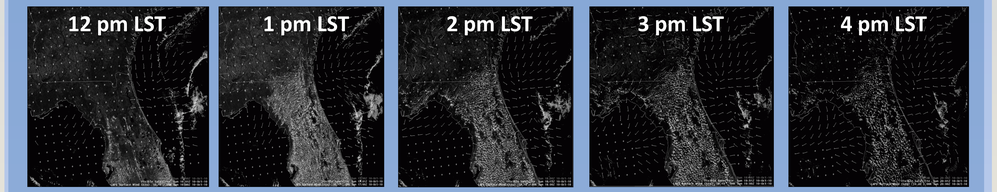
By mid to late afternoon, the low deepens as the warm surface air rises. This consequently draws the sea breeze fronts farther inland toward the surface low. As the sea breezes move inland, they force warm, moist air upward along their leading edge which creates enhanced convection.



By late afternoon or evening, the sea breezes may near each other. If the two sea breezes collide or merge, then the there is strong convergence which can create strong convection. Where the sea breezes merge is typically the area most favored for higher rain and thunderstorm chances.

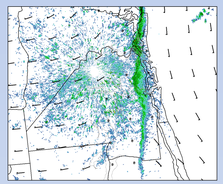
Visible Satellite Sea Breeze Development & Propagation

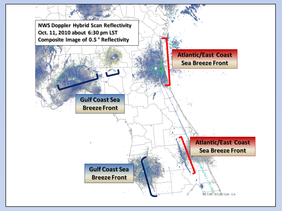
October 10, 2010

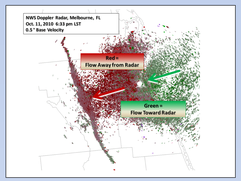


- Sea breeze front leading edge marked by cumulus line between the coast and inland cumulus cloud field. Note river and lake breezes.
- As thermal low deepened inland , the sea breezes progressed inland.
- Sea, river, lake breeze convergence enhanced convection .

Doppler Radar Sea Breeze Detection







Florida East Coast Sea Breeze Propagation Inland

June 2006 Photos by Bob Pickering

East

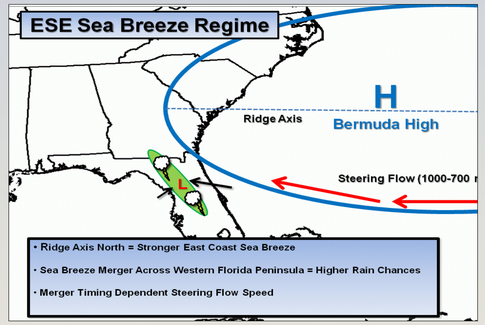
North

- Cumulus line progressed west (inland) along leading edge of sea breeze front.
- Calm lake waters became increasingly turbulent with the sea breeze.

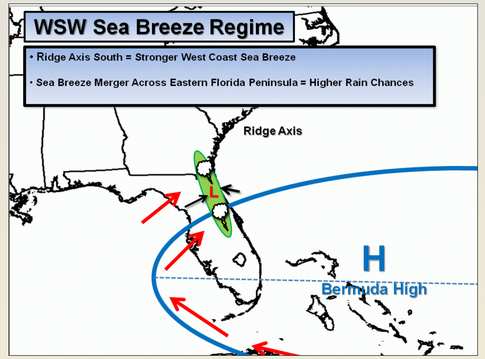
Local Sea Breeze Regimes

- Relative axis position of the Bermuda Ridge can determine low level steering flow.
- This steering flow regime helps push one sea breeze inland faster.
- The faster sea breeze often merges with the weaker one near its coast.

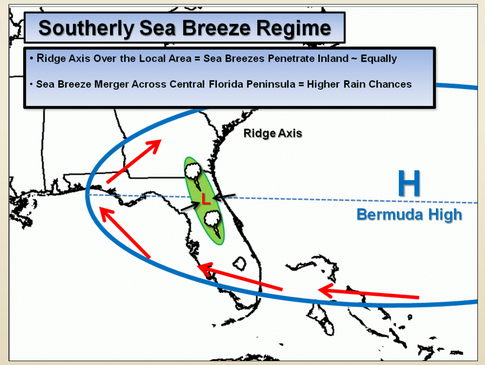
If the ridge axis is north of the local area, then the east coast (Atlantic) sea breeze will move inland faster than the west coast (Gulf of Mexico) sea breeze. The sea breeze merger would likely occur near the western side of the Florida peninsula, and consequently this area would be most favored for rain and t-storms.



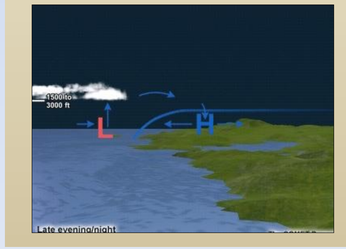
If the ridge axis is south of the local area, then the west coast sea breeze will move inland faster than the east coast sea breeze. The sea breeze merger would likely occur near the eastern side of the Florida peninsula.



If the ridge axis is over the local area, then there would be very light steering flow. In this situation, the sea breezes would likely propagate inland at about the same speed and likely merge across the interior of the Florida peninsula. If the ridge center was closer to the Florida peninsula, then strong sinking motion could Counter any lift from the sea breezes…leading to minimal t-storm activity.



The Land Breeze



The sea breeze circulation reverses at night and becomes the land breeze. The land becomes cooler than the water and thus the placement of the L and H reverse. Locally, when the land breeze encounters the warm Gulf Stream, a line of nocturnal t-storms is often observed offshore of the coast.